

Nebraska.—Hay Springs, 7th.
New Mexico.—Lava, 4th.
New York.—Palmyra, 2d; Rochester, 11th, 13th.
Pennsylvania.—Pittsburg, 11th.
South Carolina.—Spartanburg, 6th.
Tennessee.—Nashville, 6th.
Utah.—Frisco, 7th.
Wisconsin.—Delaware, 21st; Embarras, 26th.

SLEET.

Sleet occurred at Pike's Peak, Colorado, on the 3d, 4th, 7th, 8th, 15th, 16th, 17th, and 31st.

WINDS.

The most frequent directions of the wind during August, 1886, are shown on chart ii by the arrows flying with the wind; they are also given in the table of miscellaneous meteorological data. Along the Pacific coast the winds were mostly westerly; on the coast of the south Atlantic states the prevailing direction of the wind was from the southwest; in the west Gulf states the wind was generally from the southeast; in the Missouri Valley, from the south. In all other districts the wind was variable.

HIGH WINDS.

[In miles per hour.]

Wind-velocities of fifty or more miles per hour were recorded during the month, as follows:

Mount Washington, New Hampshire, 88, nw., 4th; 61, nw., 9th; 54, nw., 10th; 64, nw., 11th; 70, w., 12th; 59, sw., 13th; 80, nw., 14th; 80, nw., 15th; 62, s., 16th; 64, nw., 26th; 55, nw., 27th; 60, sw., 30th; 57, nw., 31st.

Fort Macon, North Carolina, 56, se., 6th.

Sandy Hook, New Jersey, 60, n., 7th.

Keokuk, Iowa, 60, nw., 12th.

Galveston, Texas, 53, ne., 20th.

San Antonio, Texas, 60, n., 20th.

Fort Totten, Dakota, 52, nw., 29th.

LOCAL STORMS AND TORNADOES.

Kalamazoo, Kalamazoo county, Michigan: a tornado is reported to have passed over parts of Kalamazoo and Barry counties at 10 a. m. of the 1st. Its course was marked by uprooted and twisted trees, unroofed barns, and prostrated windmills and fences. At the village of Hickory Corners a church steeple was blown down and many other buildings damaged. The storm was accompanied by heavy rainfall.

Hohokus, Bergen county, New Jersey: a heavy thunder and rain storm occurred at this place on the night of the 1st-2d. Shortly before midnight a high gale set in, blowing down a number of trees and destroying windows. One house was moved from its foundation and partly wrecked.

Hartland, Kearney county, Kansas: on the 5th a tornado passed over this place, demolishing twenty houses, as well as doing great damage to growing crops. Sixteen cars were blown from the Atchison, Topeka, and Santa Fé Railroad tracks, and two miles of telegraph wires west of the town were prostrated. Other towns in the vicinity of Hartland were visited by the tornado, but the damage done was slight.

Decatur, Illinois: on the afternoon of the 5th a severe thunder-storm, accompanied by high wind and hail, occurred in this section. The wind damaged buildings and stripped trees of their fruit, while large forest trees were uprooted and growing corn destroyed. Considerable damage was done by hail in the surrounding country. A heavy black cloud which preceded the storm presented the appearance of a tornado cloud, alarming the people, and causing many to seek security in cellars.

Cairo, Illinois: a very destructive storm of hail, rain, and wind occurred about 3 p. m. of the 6th at the town of Metropolis, twenty miles northeast of Cairo. Trees were uprooted, limbs torn off and carried at a rapid rate along the track of the storm, and fences, growing corn, and light buildings leveled to the ground. It is reported that hail fell to the depth of three inches and was still lying in heaps on the morning of the 7th.

Huron, Dakota: a heavy storm of rain and hail, followed by a destructive southwest gale, occurred here on the afternoon and evening of the 7th. The gale set in after the storm of hail and rain had passed, and continued only three minutes, overthrowing a number of small buildings and blowing down chimneys and fences. At the Dakota Agricultural Fair grounds the amphitheatre, grand stand, and several other structures were demolished, together with a great deal of the fencing, barns, and sheds. At the town of Newark, about one hundred miles north of here, five persons were killed and much property destroyed.

Frisco, Utah: a thunder-storm and heavy rain set in at 7.35 p. m. of the 7th. From 7.40 to 7.55 p. m. hail fell in considerable quantities. The storm did some damage by flooding cellars and undermining the trestle work of the railroad bridge near this place, rendering the passage of trains unsafe.

Aberdeen, Brown county, Dakota: on the night of the 10-11th a severe thunder-storm occurred in this town and vicinity. Northwest of this place the storm assumed the form of a tornado, destroying a farm house, several barns, and numerous grain-stacks in a track extending from ten miles west of Westport to Ordway. Another severe storm occurred here on the 16th.

Geneva, New York: between 6 and 7 p. m. of the 11th a very severe thunder-storm passed over this place. The storm was accompanied by heavy rain, hail, and wind. Many trees were uprooted and houses unroofed. The storm was also felt in Rochester, where the wind blew a gale. Much damage was done in the country by hail and in the city by overflowed sewers.

Pittsburg, Pennsylvania: a severe storm of wind and rain passed over this section at 10 p. m. of the 11th, doing a great deal of damage. Telegraph wires were blown down and several houses unroofed.

Akron, Summit county, Ohio: a destructive rain, wind, and thunder-storm occurred at this town on the night of the 11-12th. Numerous trees and fences were blown down and two houses wrecked. Fruit and other crops were destroyed in large quantities.

Keokuk, Iowa: at 3.45 p. m. of the 12th a thunder-storm and light rain began; at 3.52 p. m. the wind shifted to the northwest and a gale of sixty miles per hour and heavy rain set in. The wind decreased to brisk and veered to southeast at 4.45 p. m., the rain becoming light at the same time. The storm is estimated to have damaged property in this town to the extent of \$15,000. A number of business houses were unroofed and a church spire blown down. The storm extended over this section of the state, and reports from numerous places in the surrounding country show that considerable damage was done to buildings and crops. The vicinity of the towns of Creston and Mount Pleasant suffered severe injury.

Saint Louis, Missouri: at 7 p. m. of the 12th the wind suddenly increased in velocity from fresh to a northwest gale, blowing for a time at the rate of forty-five miles per hour, and causing a sudden fall in temperature of 18°. At 7.30 p. m. a thunder-storm and light rain set in and continued until 10 p. m. The wind carried away one hundred and fifty feet of the woodwork of a large bridge in the city, and destroyed much corn in the country.

Cairo, Illinois: a thunder-storm and high wind occurred in this vicinity shortly after 11 p. m. of the 12th. Between 11 and 11.30 p. m. the wind attained a maximum velocity of thirty-eight miles per hour from the northwest. At Hannibal, Missouri, the storm was reported to have been very severe, blowing off roofs and injuring several persons.

Springfield, Illinois: a heavy thunder-storm and high wind prevailed at this place from 6.53 p. m. until midnight of the 12th. At 7.15 p. m. the wind attained a velocity of thirty-three miles per hour from the west. A number of signs, chimneys, and fences were blown down during the gale.

Chicago, Illinois: on the 12th the long drought was broken in southern Iowa and Illinois by a severe thunder-storm, accompanied by heavy rain and high wind. Numerous reports from

towns in Illinois and Iowa indicate that the storm was of great severity, the wind and rain combined doing great damage to trees and crops. The storm was especially destructive to the corn crop, as many acres were blown down. Although the wind was destructive to corn the heavy rain revived the grass and insured fall pasturage for stock.

Hannibal, Marion county, Missouri: on the afternoon of the 13th, after a warm day, highest temperature 100°, a heavy wind storm, succeeded by rain, set in. The roof of the Electric Light building was carried away, and numerous trees and light structures throughout the town were blown down.

Pekin, Tazewell county, Illinois: a heavy rain occurred here on the 13th, breaking the disastrous drought. The storm was accompanied by a gale of wind, blowing down trees and fencing. Reports from the surrounding country show that copious rain fell, doing great good to the corn crop, which had suffered severely from the drought. During the storm a large barn was struck by lightning and burned.

Philadelphia, Pennsylvania: on the 13th, between 3 and 4 p. m., an unusually severe thunder-storm and heavy rain occurred in the northern part of Berks and the southern part of Schuylkill counties, uprooting trees, blowing down sheds and light barns, as well as seriously injuring the corn and oat crop. The storm was most severe along the line of the Philadelphia and Reading Railroad, which was washed out in several places.

Evansville, Vanderburg county, Indiana: about 5 p. m. of the 14th a tornado passed over Newburg and other places in Warrick county, damaging property to a considerable extent. A flour mill was unroofed, and several dwellings blown down or injured by falling trees.

Saint Paul, Minnesota: heavy thunder-storms, accompanied by high wind, occurred in various places in Minnesota and Dakota on the afternoon of the 15th. At Elkton, Dakota, a railroad depot was unroofed and a church was blown from its foundation. At Larimore, Dakota, a church was also blown down. A number of frame houses were destroyed and several cars blown from the track at Dalton, Minnesota. At the same place twenty buildings were unroofed. Farmers also suffered considerable loss, their grain where standing being beaten to the ground and that in shock scattered.

Bismarck, Dakota: on the 15th, at 4.10 p. m., a thunder-storm began and continued until 7 p. m. The storm was accompanied by hail, which fell from 4.23 to 4.31 p. m., the stones being the size of marbles; also by high wind from the southwest. At 4.20 p. m. the wind suddenly shifted to the north, at the same time increasing in force until at 4.55 p. m. it had attained a velocity of forty-eight miles per hour. During the storm three houses were unroofed and several fences and sheds blown down by the wind, as was also numerous trees and telegraph poles.

Davenport, Iowa: on the 15th, at 4.32 p. m., a thunder-storm began, passing over the town from west to east. This storm after passing into Illinois developed into a tornado. At Cambridge, Henry county, Illinois, thirty miles southeast of Davenport, a heavy rain and wind storm passed over the town, blowing down the steeples of three churches and the town hall. The streets were blockaded with fallen trees and timber from houses. Considerable damage was done to crops.

Hamburg, Berks county, Pennsylvania: on the afternoon of the 16th a disastrous thunder and hail storm passed over this town and vicinity. Very heavy rain fell for two hours, badly washing the Philadelphia and Reading Railroad in several places. The corn and fruit crops were considerably injured by hail. Several barns in the adjacent country were struck by lightning and burned.

Cairo, Illinois: at 9.15 p. m. of the 17th a thunder-storm passed north of this city. Heavy thunder and vivid lightning continued during the night, but no rain fell. At Mound City the storm was quite destructive; a large furniture factory was unroofed and several buildings belonging to the Mound City Stave Company were badly damaged. A church, in which ser-

vices were being held, was struck by lightning and several persons injured. The storm was accompanied by heavy rain and hail, the hail-stones being as large as hickory nuts. After the storm had subsided over two hundred sparrows were found under a large tree, killed either by lightning or hail. Along the line of the Illinois Central, and Cairo, Vincennes, and Chicago Railroads the storm was severe and destructive to property. At Centralia, Illinois, the wind moved with the velocity of a hurricane and was accompanied by heavy rain and hail. Throughout a belt of country two miles in width and many miles in length, numerous houses and barns were wrecked and streets blockaded with fallen trees. Hay-stacks, growing corn, and orchards laden with fruit were leveled to the ground, entailing a loss upon farmers of many thousands of dollars. At Carlyle, Tuscola, Mount Vernon, and various other places in Illinois, the destructive effects of the storm were severely felt by farmers, whose crops were destroyed and orchards blown down.

Washington, Wilkes county, Georgia: on the 18th a very severe thunder and hail storm occurred. The rainfall was heavy, 4.25 inches falling between 2.45 and 5 p. m. The storm was accompanied by high wind, which did considerable damage to farm property besides, carrying away the roof of a railroad depot.

Webster, Day county, Dakota: on the 21st this locality was visited by a gale which overturned and scattered stacks of hay and wheat as well as small buildings. The gale commenced at 12.30 p. m. and continued about an hour. Temperature before the storm, 103°; after the storm, 71°.

Rochester, New York: a severe thunder-storm began at 12.07 p. m. of the 30th; the storm was accompanied by heavy rain, 3.34 inches falling from 12.07 to 4.30 p. m., which is in excess of any rainfall that has occurred heretofore in this city in such a short time. In many sections the sewers were inadequate to carry off the water, and cellars were flooded, and considerable property injured.

TORNADO STUDIES FOR AUGUST, 1886.

[Prepared by Lieut. Jno. P. FINLEY, Signal Corps, U. S. Army, Assistant.]

In the study of tornadoes for the month of August, 1886, it has appeared desirable to prepare a chart (number viii) showing the relation of tornado centres to areas of barometric minima, selecting a day on which the conditions were fairly well shown.

In this connection it should be remembered that August is near the close of the tornado season, especially for the states in the Mississippi and Missouri valleys. As determined from the records of a long series of years, June is the month of greatest frequency, August standing sixth on the list, with considerably less than half as many storms.

Considering the tornado season by districts, it may be generally stated that in the south Atlantic and Gulf states they occur mostly from February 15th to April 15th; west of the Mississippi, from April 15th to June 15th; east of the Mississippi, from June 15th to August 15th; in the middle Atlantic states and New England, from July 15th to September 15th.

On chart number viii, which is the 3 p. m. (eastern time) tri-daily weather map of August 16th, the isobars are drawn for every tenth of an inch difference in pressure, and the isotherms for every difference of 10° in temperature. The words "High" and "Low," as used on the chart, indicate the centres of the regions of highest and lowest pressure, respectively. The location and direction of progressive movement of the tornadoes are shown by the following sign, $\times \times \times \times \longrightarrow$, placed upon the chart, and to the southeast of the centre of lowest pressure.

The tornadoes of August 16th occurred in Wyoming county, New York, between the hours of 3.30 and 4 p. m., local time, as will be seen by reference to the accompanying table.

These storms were associated with low-pressure area number vi, which was central on the afternoon of the 16th just north of Lake Erie; lowest barometer, 29.61, at Toronto, Canada. By reference to the chart, number viii, it will be seen that the

low-pressure area became extremely elongated to the north-east and southwest, with very high temperatures in the latter portion of the elliptical area. In Indian Territory, Kansas, and Missouri, the temperatures ranged from 95° to 104°. A small area of low pressure, 29.70, formed in northern Missouri, with fresh to brisk winds and high temperature gradients. Over a distance of about three hundred and fifty miles, in a line northwest and southeast, the temperature gradient was 35°, with opposing northerly and southerly winds.

Considering the principal area of low pressure, which was north of Lake Erie, we find the contrast in temperature gradient, with opposing easterly and westerly winds, to be 28° over a distance of about 280 miles in a line due north and south. In both cases the temperature gradient was about 7° per geographical mile. This was the result as determined along the line of maximum gradient in both areas of low pressure, treating them as separate centres of one elongated or trough-like depression. The average temperature gradient for each central area, as determined from four separate measurements, was found to be about 4°·5 per geographical mile in the Missouri depression and about 5°·4 per geographical mile in the Lake Erie depression.

The normal gradient, as determined from the 3 p. m. (eastern time) August temperature charts for several years, is found to be about 1°·9 per geographical mile for the region of the Lake Erie depression, and about 0°·94 per geographical mile for the region of the Missouri depression. From the above it is seen that the gradient of the former depression was about 3°·5 above the normal, and of the latter about 3°·56 above; this makes the temperature gradient in both regions practically the same, so far as the relation to the normal is concerned; while in the case of the average temperature gradient, the Lake Erie depression was 0°·90 per geographical mile higher than the Missouri depression.

The storm record for the 16th of August was considerably augmented by occurrences in other sections of the country, south and west of New York. From the extreme northwestern portion of West Virginia two heavy cloud-bursts were reported, together with violent winds, causing much destruction to life and property. In northern Indiana violent local storms occurred at, or near, Fountaintown, La Porte, Logansport, and Michigan City. In northern, western, and southern Missouri there were heavy winds and rain; also in northern Illinois with hail; in northern and central Ohio, and in extreme southern Michigan.

By reference to the table of thunder-storms it will be seen that the 16th of August was the great thunder-storm day of the month, a total of 298 storms being reported from the region embraced by the trough-like depression of low-pressure area vi.

By reference to chart number viii it will be seen that the tornado tracks are located to the southeast of the centre of lowest pressure, in what has been called the "dangerous octant" of an area of barometric minima. In this case the tornado centres are distant about 180 miles to the southeast. The direction of progressive movement of the area of low pressure during the afternoon of the 16th was about east-northeast, while the progressive motion of the tornado centres was due northeast, making an angle of about 30° with the former. In the Lake Erie depression the tornado centres lay east of the north and south line of maximum temperature gradient a distance of about 240 miles. In the Missouri depression the local storm-centres lay south and east of the line of maximum temperature gradient a distance of from 260 to 480 miles.

As has been enunciated in Professional Papers of the Signal Service number xvi, "Tornado Studies for 1884," there is a definite portion of an area of low pressure within which the conditions for the development of tornadoes is most favorable, and that portion is the southeast quadrant.

Report of tornadoes for the month of August, 1886, by Lieut. J. P. Finley, Signal Corps, U. S. Army, Assistant.

Place.	Date.	Time.	Direction.	Form of cloud.	Number of persons killed.	Number of persons wounded.	Width of path.	Number and kind of animals killed.	Number and kind of buildings destroyed.	Total valuation of property destroyed.	Authority.
Leipsic, Ohio a.....	1	2.30 p. m.	se.	Funnel							J. D. Hadermann.
Battle Creek, Michigan.....	1	10 a. m.							Several.....	Considerable.	"Evening News," Detroit, Michigan.
Hartland, Kansas.....	5	Evening							20 houses.....	Great.....	"Evening Star," Washington, D. C.
Beaudry, Minnesota b.....	9	2.45 p. m.	Easterly						Several buildings.....		J. T. Beaudry.
Near Aberdeen, Dakota.....	11	Early a. m.							4 dwellings, 3 granaries, and 2 barns.....	Considerable.	"Pioneer Press" of Saint Paul, Minnesota.
Attica, Indiana.....	12	8.15 p. m.							1 factory.....	\$1,700	A. S. Pencock.
Newburg, Indiana.....	14	5 p. m.							2 houses destroyed and 1 mill damaged.....	Great.....	"Globe-Democrat" of Saint Louis, and "New York Herald."
Dalton, Albert Lea, and Breckenridge, Minnesota.....	15	Between 7 and 10 p. m.				1			5 barns destroyed and many buildings damaged.....	Considerable.	G. W. McMillen and "Daily Globe" and "Pioneer Press" of Saint Paul, Minnesota.
La Moure, Fort Abercrombie, Wild Rice, Hickson, Brampton, and Newark, Dakota. c	15	6.30 p. m.	ese.	Funnel	4	Many	2 miles	Several horses	1 hotel, 4 stores, 7 dwellings, 7 barns, 1 school, 1 church.....	Great.....	T. E. Riggan, W. A. Ellsworth, J. H. Ardy, G. W. McMillen, and W. H. Atwater, and "Daily Globe" of Saint Paul, Minnesota.
Wyoming, Warsaw, Martinsville, and Castile, New York. d	16	3.30 to 4 p. m.	ne.	Funnel					Several buildings damaged.....	Considerable.	W. E. Cushing and "Democrat Review," "Wyoming County Times," and "Western New Yorker," New York.
Agency, Missouri e.....	17	6 p. m.	e.						Several buildings damaged.....		Thos. B. Best.
Elmont, Texas f.....	18	3.30 p. m.								Small.....	W. A. Rexroat.
Buffalo, Cochran's Mills, Co-kato, and Keystone, Minnesota. g	21	5 p. m.	ne. ?	Funnel					1 house, etc.....	Considerable.	C. K. Dodd, M. V. Cochran, and Axle Jorgenson.
Enderly, Minnesota h.....	21	4.20 p. m.	ne. ?						A number of buildings damaged.....	Considerable.	Edward Lewis.
Lyons Station, Connersville, and Quakertown, Indiana. i	22	3.25 to 6 p. m.	se.	Funnel			200 yards		1 barn damaged, etc.....		J. V. Lyons, R. Kessler, and the postmaster at Quakertown, Indiana.
San Antonio and Comanche, Texas.....	24	5 p. m.	so.	Funnel					4 buildings damaged.....		Aug. Holzapfel, E. N. Wiesendanger, and newspaper clippings.

a Funnel-shaped cloud swaying to and fro.

b Clouds were black, running fast, with little cloud amongst them turning around.

c Heavy timbers carried long distances; a two inch plank was carried through the air and forced through a roof.

d Two dark clouds were passing each other, one from the sw. and the other from the ne.; as they collided they moved due n.

e In some places the debris showed pressure on ground, in some places straight wind, and in some places a circular effect was shown.

f A small cloud formed in se., and all surrounding clouds seemed to gather to it. It was only about thirty minutes from the time it formed until it struck the ground about one and a fourth miles se. of Elmont, moving gin house six inches.

g A light cloud, with slow motion, coming from the w., with a black cloud below, with tremendous swift motion.

h At base of main cloud there arose a dense mass of cloud, in color and appearance like escaped steam from a large engine, which went rushing s. with a speed of eighty miles and upward per hour, sweeping everything in its way.

i Tornado cloud in commotion, swaying from side to side.

Table of miscellaneous meteorological data for August, 1886—Signal Service observations.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).					Temperature of the air (in degrees Fahrenheit).										Winds.														
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.		Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.		Monthly range.	Daily ranges.		Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Total movement.	Prevailing direction.	Maximum velocity.	Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.				
					Highest barometer.	Lowest barometer.				Max.	Min.		Greatest.	Least.																	
New England.																															
Eastport	61	29.86	— .05	29.93	30.35	29.37	30.99	59.2	— 1.5	81.6	28	67.2	47.0	52.3	34.6	28.8	9	3.1	30.84	1	54.0	2.41	— .03	3,993	nw.	25	17	9	2	13	16
Portland	99	29.83	— .05	29.93	30.36	29.44	30.92	64.7	— 3.0	87.0	11	73.7	49.3	57.1	37.7	28.6	26	5.8	774.5	55.4	3.93	— .03	4,561	nw.	22	13	9	2	15	13	
Mount Washington	6,279	23.87	— .06	29.96	30.46	29.41	21.04	46.8	— 0.3	68.9	27	53.7	28.3	41.0	40.6	25.2	2	4.2	486.4	42.0	8.34	— .04	20,750	nw.	88	13	9	2	15	13	
Boston	125	29.82	— .06	29.95	30.36	29.47	30.90	67.7	— 1.6	90.4	27	76.8	49.3	59.7	41.1	32.0	23	7.3	257.7	57.3	3.64	— .05	7,152	nw.	34	13	9	2	15	13	
Block Island	27	29.94	— .06	29.96	30.35	29.51	30.84	67.2	— 1.3	80.0	12	72.9	54.5	62.0	25.1	17.3	16	5.3	258.7	63.7	2.47	— .04	8,366	sw.	40	25	10	3	13	15	
Narragansett Pier	107	29.86	— .06	29.96	30.35	29.54	30.81	67.4	— .85	85.0	12	76.0	45.0	58.8	40.0	—	—	—	—	—	3.51	— .03	—	—	—	—	—	—	—	—	
New Haven	107	29.86	— .06	29.96	30.35	29.54	30.81	68.2	— 2.0	85.6	14	78.1	47.8	59.5	37.8	29.5	22	8.2	317.6	59.9	4.56	— .12	4,167	nw.	24	11	7	11	6	15	10
New London	47	29.94	— .05	29.98	30.37	29.55	30.82	67.9	— 1.9	83.7	12	75.6	49.8	60.7	33.9	25.7	22	5.4	179.8	61.0	5.04	— .03	4,149	nw.	27	17	11	4	19	8	
Mid. Atlantic States.																															
Albany	83	29.89	— .05	29.97	30.36	29.59	30.77	70.3	— 0.3	92.7	29	81.6	52.0	59.5	40.7	32.5	29	13.1	306.5	56.8	0.87	— .28	3,684	nw.	31	29	8	5	13	13	
New York City	168	29.82	— .05	29.98	30.34	29.60	30.73	71.0	— 1.1	87.7	29	79.3	57.8	64.9	29.9	24.1	5	6.8	771.5	60.6	1.18	— .39	5,064	nw.	24	21	9	6	14	14	
Philadelphia	117	29.87	— .05	29.98	30.35	29.63	30.72	73.2	— 0.5	91.8	29	82.5	56.1	66.2	35.7	24.6	22	4.4	776.8	64.8	1.38	— .37	5,711	nw.	36	24	10	6	17	11	
Atlantic City	13	29.95	— .07	29.95	30.31	29.58	30.73	71.4	— 0.6	86.5	2	77.0	55.3	65.1	31.2	18.9	4	6.9	198.4	66.1	3.58	— .14	5,410	sw.	37	30	7	11	8	11	11
Sandy Hook	28	29.93	— .08	29.95	30.31	29.58	30.73	71.8	— 0.9	89.2	28	79.1	59.8	66.0	29.4	20.2	26	3.0	778.1	64.2	2.75	— .02	9,441	sw.	60	30	7	7	5	11	15
Cape Henlopen	45	29.94	— .05	29.98	30.33	29.67	30.67	73.5	— 1.8	92.0	27	82.0	58.1	66.6	33.9	20.6	5	8.3	772.0	63.2	3.94	— .05	3,680	nw.	17	30	8	6	13	12	
Ocean City	106	29.88	— .06	29.98	30.33	29.69	30.64	73.1	— 1.6	92.0	27	81.9	55.8	64.8	36.2	23.4	5	6.9	775.0	63.9	2.43	— .23	3,371	nw.	16	24	10	6	12	13	
Washington City	16	29.97	— .05	29.97	30.31	29.63	30.60	74.1	— 2.2	90.8	17	79.0	64.8	70.2	26.0	17.7	17	3.5	193.2	68.4	5.27	— .03	9,439	ne.	44	24	15	8	14	9	
Cape Henry	8	29.98	— .05	29.97	30.31	29.63	30.68	73.2	— 0.2	87.2	12	78.2	59.0	67.6	28.2	16.5	27	6.1	318.2	67.0	6.71	— .27	6,906	nw.	37	24	10	6	17	8	
Chincoteague	652	29.92	— .04	29.99	30.31	29.68	30.63	73.8	— 1.8	91.8	27	84.2	57.3	65.7	34.5	25.6	25	11.2	782.5	67.3	4.29	— .01	1,816	nw.	14	24	15	14	9	16	6
Lynchburg	30	29.96	— .05	29.97	30.30	29.69	30.61	74.5	— 2.6	92.8	17	82.7	64.4	69.2	28.4	21.0	12	5.0	248.5	67.9	10.23	— .45	3,280	ne.	23	24	17	13	12	6	
Norfolk	30	29.96	— .05	29.97	30.30	29.69	30.61	74.5	— 2.6	92.8	17	82.7	64.4	69.2	28.4	21.0	12	5.0	248.5	67.9	10.23	— .45	3,280	ne.	23	24	17	13	12	6	
South Atlantic States.																															
Charlottesville	808	29.18	— .02	29.99	30.26	29.68	30.57	75.1	— 1.2	91.9	26	85.5	56.4	65.5	35.5	25.6	12	10.8	104.8	69.7	6.34	— .17	3,101	sw.	26	12	15	12	17	2	
Fort Macon	11	29.99	— .03	29.97	30.28	29.60	30.48	76.5	— 1.4	86.5	23	81.4	64.9	72.5	21.6	19.4	23	5.0	248.7	72.3	7.08	— .06	1,174	sw.	56	16	17	10	17	4	
Hatteras	12	29.99	— .03	29.98	30.31	29.61	30.47	75.5	— 2.0	84.3	1	80.1	65.5	71.5	18.8	12.3	5	4.0	228.7	71.1	9.74	— .35	7,140	sw.	36	24	18	6	19	6	
Kitty Hawk	9	29.99	— .05	29.98	30.32	29.63	30.49	74.9	— 1.9	90.5	17	79.8	65.6	70.7	24.9	19.7	12	2.6	218.3	69.0	7.34	— .01	10,659	ne.	44	24	17	10	15	6	
New River Inlet	34	29.95	— .05	29.96	30.24	29.73	31.05	77.4	— 1.9	87.0	17	82.2	58.8	71.1	28.2	20.8	22	5.5	686.7	72.9	3.36	— .21	7,624	sw.	28	1	16	12	13	6	
Smithville	52	29.94	— .04	29.97	30.25	29.72	30.53	77.0	— 1.5	92.8	12	85.5	60.2	70.7	32.6	21.9	25	7.0	682.2	70.7	4.38	— .35	4,517	sw.	20	2	16	10	14	7	
Wilmington	52	29.94	— .04	29.97	30.25	29.72	30.53	77.0	— 1.5	92.8	12	85.5	60.2	70.7	32.6	21.9	25	7.0	682.2	70.7	4.38	— .35	4,517	sw.	20	2	16	10	14	7	
Charleston	52	29.95	— .03	29.97	30.18	29.73	30.46	77.4	— 3.3	92.0	13	85.3	66.2	73.3	25.8	15.9	23	6.9	412.4	72.2	3.28	— .48	5,313	sw.	21	9	13	10	10	11	
Augusta	183	29.82	— .04	29.98	30.18	29.68	30.50	77.6	— 2.0	100.6	15	89.0	60.7	72.2	39.4	29.8	14	6.1	979.9	69.9	2.29	— .24	2,515	sw.	16	1	9	8	14	9	
Savannah	87	29.92	— .03	29.97	30.20	29.72	31.07	79.9	— 0.7	93.2	1	86.8	65.8	74.2	27.4	18.0	24	8.0	683.0	73.8	7.32	— .80	4,637	sw.	32	9	16	8	17	6	
Jacksonville	43	29.97	— .02	29.98	30.20	29.73	30.44	80.4	— 0.5	93.8	14	88.8	64.9	74.5	28.9	19.2	12	6.8	308.5	73.7	6.25	— .08	4,092	sw.	25	3	15	7	18	6	
Florida Peninsula.																															
Cedar Keys	22	30.01	— .01	29.99	30.19	29.81	30.38	80.8	— 1.0	92.7	18	87.0	68.7	75.0	24.0	20.4	13	5.8	279.7	73.5	7.08	— .24	6,136	sw.	32	30	12	11	14	6	
Key West	20	29.97	— .03	29.94	30.12	29.68	30.44	84.9	— 0.6	100.0	4	91.4	73.1	79.2	20.9	19.2	24	6.9	1174.5	75.6	4.54	— .05	8,488	ne.	40	2	18	14	6	2	
Sanford	25	29.96	— .03	29.94	30.15	29.73	30.42	79.6	— 0.6	94.4	1	88.7	67.9	73.1	26.5	20.2	24	7.4	318.3	72.9	4.12	— .08	4,406	ne.	26	20	15	7	12	5	
Eastern Gulf States.																															
Atlanta	1,129	28.86	— .03	29.99	30.21	29.70	30.51	76.1	— 0.5	94.0	15	85.7	62.0	68.8	32.6	21.4	22	8.0	578.7	68.2	2.36	— .19	5,241	nw.	26	1	11	3	18	10	
Pensacola	30	29.94	— .04	29.93	30.15	29.70	30.45	80.9	— 0.5	95.6	15	88.8	70.3	75.5	25.3	18.6	13	5.8	1180.0	73.8	8.82	— .17	4,862	sw.	24	26	15	5	17	9	
Mobile	35	29.95	— .03	29.95	30.17	29.74	30.43	79.9	— 0.8	97.0	15	89.0	67.4	73.3	29.0	24.0	15	9.1	176.9	71.2	3.55	— .34	4,670	nw.	28	23	12	2	11	9	
Montgomery	219	29.76	— .04	29.96	30.16	29.71	30.49	80.0	— 0.1	97.8	16	89.9	60.4	72.8	31.4	25.7	16	7.4	275.3	70.7	5.37	— .17	3,172	sw.	20	5	11	6	14	9	
Vicksburg	222	29.76	— .05	29.96	30.20	29.75	30.41	80.4	— 0.0	96.3	18	90.7	66.1	72.3	30.2	22.8	8			71.3	4.42	— .05	3,180	sw.	24	3	9	14	15	11	

Table of miscellaneous meteorological data for August, 1886—Signal Service observations—Continued.

Stations.	Elevation above sea level.	Atmospheric pressure (in inches and hundredths).					Temperature of the air (in degrees Fahrenheit).										Winds.														
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.		Monthly mean.	Departure from normal.	Extremes.				Monthly range.	Greatest.	Least.	Date.	Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Total movement.	Prevailing direction.	Maximum velocity.								
					Highest barometer.	Lowest barometer.			Max.	Date.	Mean max.	Min.											Date.	Miles p. h.	Direction.	Date.	No. of rainy days.	No. of fair days.	No. of clear days.		
Upper Miss. Valley.																															
Saint Paul.	831	29.05	—0.04	29.93	30.22	18	29.69	12.0	69.6	0.2	94.2	82.3	42.1	31	59.7	52.1	37.0	7	9.3	28	69.8	58.0	2.27	—1.49	4,842	W.	31	8	2	16	13
La Crosse.	725	29.20	—0.02	29.96	30.21	18	29.72	16.0	73.0	2.2	91.3	82.3	48.8	31	64.6	42.5	26.2	8	9.0	28	79.2	65.9	3.90	—0.25	4,465	W.	36	21	7	2	18
Davenport.	615	29.30	—0.06	29.94	30.17	19	29.66	29.0	74.4	1.5	96.8	85.6	49.2	31	65.1	47.6	30.8	12	13.0	17	67.0	61.4	2.67	—1.54	4,582	E.	32	12	9	8	13
Des Moines.	849	29.06	—0.07	29.93	30.13	31	29.65	15.0	76.8	4.3	101.6	80.1	46.0	31	67.0	55.6	35.1	7	14.0	13	67.2	63.8	1.10	—3.75	3,176	W.	24	11	9	11	11
Dubuque.	665	29.24	—0.06	29.94	30.18	19	29.69	13.0	74.1	2.5	97.4	85.9	45.5	31	63.8	51.9	34.0	8	8.2	14	65.3	60.3	0.67	—3.18	3,261	W.	18	20	9	7	14
Dubuque.	618	29.29	—0.06	29.93	30.13	19	29.71	10.0	77.1	2.2	99.1	88.1	53.4	31	67.8	45.7	30.1	8	12.8	23	64.2	62.7	5.60	—2.81	5,273	W.	60	12	10	3	10
Keokuk.	359	29.61	—0.03	29.97	30.17	10	29.73	29.0	76.8	0.9	97.0	85.8	57.8	31	69.6	39.2	25.7	20	9.6	17	63.3	67.8	2.84	—0.09	4,308	W.	38	13	10	2	23
Cairo.	644	29.31	—0.05	29.97	30.19	9	29.73	29.0	76.1	2.5	99.4	85.9	54.4	31	67.2	45.0	27.2	8	7.9	29	69.7	64.7	4.19	—1.32	4,006	W.	33	12	10	1	16
Springfield.	571	29.34	—0.06	29.95	30.15	9	29.72	29.0	79.9	3.3	102.0	88.5	61.0	31	70.4	41.0	20.3	28	10.6	30	59.8	63.5	2.44	—0.00	6,945	W.	46	12	9	2	19
Saint Louis.	571	29.34	—0.06	29.95	30.15	9	29.72	29.0	79.9	3.3	102.0	88.5	61.0	31	70.4	41.0	20.3	28	10.6	30	59.8	63.5	2.44	—0.00	6,945	W.	46	12	9	2	19
Missouri Valley.																															
Lamar.	1,028	28.96	—0.09	29.96	30.12	9	29.77	29.0	76.5	0.7	97.2	87.6	54.1	31	67.9	43.1	31.3	31	8.6	37	1.0	65.1	4.37	—	6,209	W.	26	10	5	2	14
Leavenworth.	842	29.06	—0.09	29.91	30.09	31	29.70	16.0	78.8	2.7	106.8	92.0	52.2	31	68.8	54.6	35.8	24	7.9	30	7.1	65.7	0.73	—2.70	1,536	W.	22	8	1	5	15
Omaha.	1,113	28.80	—0.07	29.95	30.17	2	29.68	15.0	75.6	1.5	99.0	86.9	43.6	31	66.9	55.4	30.6	24	10.9	3	65.6	62.1	2.53	—1.07	4,318	W.	22	11	10	8	6
Valentine.	2,603	27.29	—0.02	29.92	30.18	31	29.65	12.0	71.9	0.9	98.5	85.3	36.9	31	60.1	51.0	40.3	24	10.1	3	61.7	55.4	1.80	—	8,304	W.	42	11	3	6	5
Huron.	1,307	28.55	—0.06	29.92	30.20	31	29.65	13.0	70.0	2.3	100.3	84.4	33.1	31	57.9	67.2	42.9	8	14.2	27	72.4	59.1	5.62	—2.70	5,749	W.	40	13	12	3	18
Yankton.	1,234	28.63	—0.07	29.92	30.18	18	29.61	13.0	73.0	1.3	99.1	85.6	40	7	63.2	58.4	34.1	24	11.6	8	76.4	64.2	5.40	—2.53	4,318	W.	32	8	10	4	17
Northern slope.																															
Fort Assiniboine.	2,660	27.14	—0.04	29.91	30.27	29	29.61	23.0	68.1	2.8	96.4	83.8	37.6	31	51.5	58.8	48.0	31	11.8	1	15.6	43.6	0.35	—1.55	6,855	W.	42	29	4	1	15
Fort Benton.	2,661	27.19	—0.04	29.91	30.29	29	29.61	23.0	69.8	1.7	100.0	88.0	37.9	31	53.7	62.1	46.9	23	14.9	1	14.8	44.1	0.60	—0.40	2,610	W.	49	9	3	3	8
Fort Custer.	3,040	26.82	—0.04	29.89	30.23	29	29.56	23.0	71.6	2.2	104.9	89.9	37.0	31	56.2	67.9	47.3	23	18.5	5	25.3	51.5	0.71	—0.52	4,155	W.	42	11	1	1	14
Fort Maginnis.	4,340	25.59	—0.02	29.92	30.24	29	29.62	23.0	65.8	3.0	95.4	81.1	37.5	31	53.8	57.9	40.2	23	12.0	1	15.4	47.9	1.79	—0.02	3,944	W.	21	11	20	6	3
Fort Shaw.	3,550	26.35	—0.02	29.91	30.27	29	29.63	23.0	66.6	3.6	91.2	84.5	35.5	31	49.7	58.7	47.5	21	12.4	1	14.5	47.8	0.19	—0.80	2,517	W.	27	11	3	4	1
Helena.	4,669	25.84	—0.04	29.89	30.23	29	29.61	23.0	68.1	1.4	95.1	83.9	47.6	31	55.2	47.5	40.0	21	14.8	1	14.5	45.0	0.03	—0.82	5,367	W.	36	11	1	0	8
Poplar River.	2,030	27.81	—0.01	29.89	30.21	17	29.55	23.0	69.0	0.9	103.5	86.3	35.1	31	53.7	68.4	48.8	6	18.0	1	14.9	45.1	0.51	—0.32	5,967	W.	48	11	29	7	1
Deadwood.	4,600	25.44	—0.01	29.99	30.29	1	29.74	24.0	66.8	2.0	93.0	78.1	37.5	31	57.4	54.5	31.7	31	7.4	3	104.0	53.1	1.84	—0.26	1,735	W.	17	9	5	0	10
Cheyenne.	6,105	25.08	—0.04	29.94	30.20	30	29.68	12.0	73.8	2.2	99.2	86.8	44.7	31	63.0	54.5	31.3	30	11.9	16	68.6	61.1	1.99	—0.53	6,124	W.	32	8	9	0	14
North Platte.	2,841	27.08	—0.04	29.94	30.20	30	29.68	12.0	73.8	2.2	99.2	86.8	44.7	31	63.0	54.5	31.3	30	11.9	16	68.6	61.1	1.99	—0.53	6,124	W.	32	8	9	0	14
Middle slope.																															
Denver.	5,294	24.81	—0.02	29.88	30.13	5	29.69	15.0	71.0	0.8	94.3	85.2	48.5	31	58.3	45.8	32.6	9	15.9	31	55.9	51.7	1.62	—0.09	4,918	W.	34	11	3	10	2
Pike's Peak.	14,134	18.11	—0.02	29.97	30.15	29	29.83	23.0	40.5	2.1	52.4	47.3	29.0	31	35.9	53.1	46.8	2	16.2	9	14.7	35.0	3.18	—0.80	7,253	W.	40	11	8	2	3
West Las Animas.	3,899	26.06	—0.04	29.87	30.18	6	29.65	15.0	74.7	2.5	100.2	91.1	49.7	31	62.5	50.5	40.5	30	14.1	2	100.8	58.0	1.17	—0.94	4,477	W.	36	11	5	2	14
Concordia.	1,384	28.49	—0.01	29.91	30.12	31	29.64	13.0	75.9	0.9	99.2	88.9	49.9	31	65.2	49.3	36.0	24	10.1	31	71.6	65.3	2.40	—	5,157	W.	24	11	6	7	2
Dodge City.	2,517	27.19	—0.04	29.91	30.13	31	29.64	13.0	75.9	0.9	99.2	88.9	49.9	31	65.2	49.3	36.0	24	10.1	31	71.6	65.3	2.40	—	5,157	W.	24	11	6	7	2
Fort Reno.	2,650	27.26	—0.08	29.88	30.04	6	29.73	13.0	77.2	3.2	98.7	89.5	58.9	31	66.6	38.9	31.9	19	12.0	21	63.9	62.1	4.57	—1.10	6,443	W.	40	11	6	5	3
Fort Supply.	2,650	27.26	—0.08	29.88	30.04	6	29.73	13.0	77.2	3.2	98.7	89.5	58.9	31	66.6	38.9	31.9	19	12.0	21	63.9	62.1	4.57	—1.10	6,443	W.	40	11	6	5	3
Fort Elliott.	2,650	27.26	—0.08	29.88	30.04	6	29.73	13.0	77.2	3.2	98.7	89.5	58.9	31	66.6	38.9	31.9	19	12.0	21	63.9	62.1	4.57	—1.10	6,443	W.	40	11	6	5	3
Southern slope.																															
Fort Sill.	1,200	28.73	—0.03	29.93	30.07	10	29.78	29.0	82.6	3.2	104.0	95.1	62.0	31	71.3	42.0	34.0	16	9.9	21	55.5	63.0	3.40	—0.66	6,597	W.	27	11	7	2	13
Abilene.	1,745	28.18	—0.02	29.92	30.07	10	29.74	21.0	82.1	0.7	100.7	93.5	67.0	31	73.0	33.7	25.5	3	11.1	21	60.8	65.6	2.03	—	7,859	W.	48	11	21	8	3
Fort Davis.	4,928	25.23	—0.05	29.91	30.07	10	29.60	20.0	75.5	3.8	96.0	90.4	58.9	31	65.1	37.1	33.3	12	15.9	23	47.1	51.7	1.97	—3.30	4,313	W.	31	11	29	7	3
Fort Stockton.	3,004	27.08	—0.05	29.88	30.04	6	29.73	13.0	77.2	3.2	98.7	89.5	58.9	31	66.6	38.9	31.9	19	12.0	21	63.9	62.1	4.57	—1.10	6,443	W.	40	11	6	5	3
Fort Stanton.	6,150	24.06	—0.05	29.86	30.06	6	29.64	22.0	65.2	0.9	95.1	78.9	48.8	31	55.8	37.1	33.3	7	11.1	22	71.2	54.7									

COTTON REGION REPORTS.

In the following table are given the means of the maximum and minimum temperatures and the average rainfall for the cotton districts during the month of August. For the purpose of comparison, the averages for these districts during the four preceding years are also given. The rainfall, as compared with the averages of four years, is excessive in the districts of Wilmington, Memphis, Montgomery, Augusta, and Mobile; it is about normal in the districts of Atlanta and Galveston; in the other districts it is deficient. The mean of the minimum temperatures is above the average in all districts; the mean of the maximum temperature shows only slight departures from the normal.

Temperature and rainfall data for the cotton districts, August.

Districts.	Rainfall.			Temperature.								Extremes for Aug., 1886.	
				Maximum.				Minimum.					
	Average for August of four preceding years.	Average for August, 1886.	Departures.	Mean for Aug. of four pre- ceding years.	Mean for Aug., 1886.	Departures.	Mean for Aug. of four pre- ceding years.	Mean for Aug., 1886.	Departures.	Max.	Min.		
	Inch.	Inch.	Inch.	°	°	°	°	°	°	°	°		
New Orleans.....	4.15	2.69	-1.46	91.1	92.7	+1.6	71.2	71.4	+0.2	102	50		
Savannah.....	5.74	5.24	-0.50	90.8	90.7	-0.1	71.3	72.4	+1.1	106	60		
Charleston.....	7.30	4.16	-3.14	89.6	88.8	-0.8	69.0	69.5	+0.5	100	43		
Atlanta.....	4.60	4.52	-0.08	87.9	88.4	+0.5	67.4	68.9	+1.5	100	57		
Wilmington.....	4.25	7.42	+3.17	88.2	87.4	-0.8	67.3	68.7	+1.4	100	55		
Memphis.....	2.64	3.89	+1.25	88.6	89.2	+0.6	65.0	68.2	+3.2	102	44		
Galveston.....	2.32	2.59	+0.27	94.0	95.0	+1.0	70.5	73.1	+2.6	108	55		
Vicksburg.....	3.13	2.32	-0.81	90.8	92.4	+1.6	69.1	71.6	+2.5	100	61		
Montgomery.....	3.34	4.57	+1.23	90.4	90.2	-0.2	68.2	69.7	+1.5	104	52		
Augusta.....	3.81	4.52	+0.71	90.2	88.9	-1.3	67.9	69.3	+1.4	101	58		
Little Rock.....	2.45	2.05	-0.40	90.7	92.7	+2.0	65.7	68.9	+3.2	111	49		
Mobile.....	2.95	3.44	+0.49	92.2	91.2	-1.0	69.4	70.3	+0.9	104	60		

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger-points at the various river stations; the highest and lowest depths for August, 1886, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, August, 1886.

[Expressed in feet and tenths.]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, Louisiana.....	29.9	17, 18	3.3	11, 12	-0.8	4.1
<i>Arkansas River:</i>						
Fort Smith, Arkansas.....	22.0	9	13.7	31	2.7	11.0
Little Rock, Arkansas.....	23.0					
<i>Missouri River:</i>						
Yankton, Dakota.....	24.0	5, 6	20.1	29, 30, 31	18.1	2.0
Omaha, Nebraska.....	18.0	11, 12, 13	9.2	31	8.0	1.2
Leavenworth, Kansas.....	20.0	11	9.8	30, 31	7.0	2.8
<i>Mississippi River:</i>						
Saint Paul, Minnesota.....	14.5	2, 23	2.5	15	1.2	1.3
La Crosse, Wisconsin.....	24.0	27	4.6	14, 15, 18, 19	2.3	2.3
Dubuque, Iowa.....	16.0	31	4.6	16, 17, 18, 21, 22, 23	2.0	2.6
Davenport, Iowa.....	15.0	31	2.4	17 to 27	1.0	1.4
Keokuk, Iowa.....	14.0	14	2.6	21, 22, 23, 26, 27	1.0	1.6
<i>Saint Louis, Missouri:</i>						
Saint Louis, Missouri.....	32.0	18	9.3	31	6.3	3.0
Cairo, Illinois.....	40.0	11	11.8	22	9.4	2.4
Memphis, Tennessee.....	34.0	2	10.0	23, 24	7.8	2.2
Vicksburg, Mississippi.....	41.0	1	13.5	28	7.9	5.6
New Orleans, Louisiana.....	13.0	1	4.8	16, 31	3.2	1.6
<i>Ohio River:</i>						
Pittsburg, Pennsylvania.....	22.0	18	7.7	30	0.3	7.4
Cincinnati, Ohio.....	50.0	24	13.7	31	7.0	6.7
Louisville, Kentucky.....	25.0	19	7.3	17	4.5	2.8
<i>Cumberland River:</i>						
Nashville, Tennessee.....	40.0	7	10.9	1	2.7	8.2
<i>Tennessee River:</i>						
Chattanooga, Tennessee.....	33.0	8	7.1	30, 31	3.5	3.6
<i>Monongahela River:</i>						
Pittsburg, Pennsylvania.....	29.0	18	7.7	30	0.3	7.4
<i>Savannah River:</i>						
Augusta, Georgia.....	32.0	20	11.4	24	7.1	4.3
<i>Mobile River:</i>						
Mobile, Alabama.....		28	18.4	7	16.7	1.7
<i>Sacramento River:</i>						
Red Bluff, California.....		1 to 10	2.0	31	0.6	1.4
Sacramento, California.....		1	10.0	27 to 30	8.2	1.8
<i>Willamette River:</i>						
Portland, Oregon.....		1	7.5	27	2.6	4.9
<i>Colorado River:</i>						
Yuma, Arizona.....		27	16.8	14	16.1	0.7

FLOODS.

Yuma, Arizona: on the 1st light rain fell during the greater part of the day. The wind which at 7 a. m. was blowing gently from the south backed to the southeast and increased in force until at 12.15 p. m. it attained a velocity of thirty-four miles per hour. Seventy-five miles west of Yuma the rain was heavy, causing a washout on the Southern Pacific Railroad and delaying trains. On the 15th a thunder-storm began at 10.55 a. m. and continued until 4.30 p. m. During this storm 1.57 inches of rain fell, 0.80 inch falling in twenty minutes, from 2.40 to 3 p. m.; this is the largest rainfall that has occurred since the Signal Service station was established here (1876). The track of the Southern Pacific Railroad was washed out both east and west of Yuma, causing an entire suspension of traffic for several days. On the 27th heavy rain fell in the mountains east of Yuma, producing floods and destructive washouts which delayed trains.

Colorado Springs, Colorado: at 3 p. m. of the 1st very dark and threatening clouds were noticed hanging over the country north of the town, some of these were similar to tornado clouds, being funnel-shaped. Shortly after 3 p. m. very heavy rains set in and being confined within the narrow valley of Monument Creek caused a sudden and destructive freshet. At 6 p. m. the flood suddenly poured into the town, carrying away fences, bridges, and several buildings. Along Monument Creek and Shook's Run thousands of dollars worth of property in bridges and roads were destroyed. The storm was accompanied by unusually heavy hail; above the town on the following day hail still covered the ground to a depth of four inches on an average, in some places it had drifted four feet deep. Large patches of hail from one to three feet deep were deposited along the track of the flood. Trees were denuded of leaves and small branches as well as considerable bark.

Little Rock, Arkansas: during the afternoon and night of the 1st a severe thunder-storm prevailed, beginning at 4.40 p. m., with moderately heavy rain until 8.50 p. m.; at this time very heavy rain set in, and in one hour and ten minutes 2.60 inches had fallen. In consequence of this unusually large rainfall the streets were flooded and property was damaged to the extent of \$25,000. Many stores on Main street were filled with water to the depth of eighteen inches.

HIGH TIDES.

Smithville, North Carolina, 26th, 27th, 28th; Cedar Keys, Florida, 18th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Mount Washington, New Hampshire: at 8.08 p. m. of the 23d an auroral light was observed in the northwest and north. Stratus clouds were banked in the north, obscuring the arch; from behind the clouds bright streamers rose to an altitude of 80°, converging near the zenith. At 8.15 p. m. a bright band of light, elliptical in form, extended across the sky. This band moved slowly across the zenith at 8.32 p. m., after which it began to fade, and disappeared at 9.10 p. m. The aurora proper rapidly increased in brilliancy and extent, at 9.10 p. m. extending from west-northwest to east 10° north. The streamers were unusually narrow but clearly defined and very brilliant. At the time of maximum brilliancy, 9.10 p. m., a lateral motion from west to east was seen. The aurora disappeared at 1.30 a. m. of the 24th.

Washington City: a fine aurora was visible during the evening of the 23d. The first light noted was at 8.15 p. m., and consisted of a patch of greenish light in the north-northeast, near the horizon. This light seemed to spread east and west, in a few minutes the horizon, 30° either side of north, was illuminated by the light. The highest point above the horizon was not more than 15°. At 8.22 p. m. there was a sudden brightening, the light forming an arch, and was accompanied by streamers, which, in some instances, reached an altitude of 45°. This appearance gradually died away, to be succeeded at 8.26 by the same. The moments of brightening and display